

## CLAIMS

1. A multilayer observation optical microscope, wherein a pair of convergence/collimation lenses are arranged on the optical axis along which an irradiation light beam enters into an sample from the objective lens, and a phase varying means is arranged between the lenses for varying a phase of a transmitting light beam in a given area on a plane traversing the optical axis and thereby, the light beam incident on the objective lens is focused on the sample at a depth corresponding to the phase of a wavefront thereof.
2. The multilayer observation optical microscope according to claim 1, wherein, in a confocal microscope, the optical axis on which the pair of convergence/collimation lenses are arranged is an optical axis common to an irradiation light beam irradiating a sample through an objective lens and a fluorescent beam radiated from or reflected by the sample and reversely passing through the objective lens.
3. The multilayer observation optical microscope according to claim 1 or 2, wherein the phase varying means comprises a rotating disc having plural phase plate segments thereon, the respective phase plate segments having different optical characteristics and being arranged for sequentially traversing the optical axis.
4. The multilayer observation optical microscope according to claim 3, wherein the respective phase plate segments of the phase varying means comprise isotropic transparent films of different thickness so as to effect different optical characteristics thereof.
5. The multilayer observation optical microscope according to claim 3, wherein the

respective phase plate segments of the phase varying means comprise isotropic transparent films having different refractive index so as to effect different optical characteristic thereof.

6. The multilayer observation optical microscope according to any of claims 1 to 3, wherein two-dimensional scanning on a sample stage of the optical microscope and phase scanning with the phase varying means are synchronized with each other so as to enable a three-dimensional dynamic state of the sample to be observed.

7. A multilayer observation unit comprising a rotating disc having plural phase plate segments thereon, the respective phase plate segments having different optical characteristics and being adjacently arranged in a circumferential direction,

wherein the multilayer observation unit is arranged between a pair of convergence/collimating lenses disposed on an optical axis of a light beam incident on an objective lens so as to serve as a phase varying means for varying a phase of a light beam transmitting through the respective phase plate segments in a given area on a plane traversing the optical axis when the phase plate segments sequentially traverse the optical axis between the lenses, whereby a focus depth is changed according to the phase of the wavefront of a light beam incident on the objective lens through the unit.